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The Upper-Layer Circulation of the Japan Sea: Historical Data Analysis

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LONG-TERM GOAL

The circulation of the Japan Sea is characterized by significant temporal and spatial variability due to several factors, including seasonal fluctuations in the warm inflow through Tsushima Strait, branching of the Tsushima Warm Current downstream of the strait, and the formation of mesoscale eddies along these branches. The long-range objective of the present study is to understand the dynamical processes that govern this variability.

OBJECTIVES

Our objectives are to:

1. Describe the synoptic three-dimensional structure of the branching of the Tsushima Warm Current and its seasonal variability.
2. Compile a census of mesoscale eddies in the JES, characterize their three-dimensional structure and investigate the effect of seasonal buoyancy fluxes on that structure.
3. Provide a better description of the origin of the Tsushima Warm Current in the East China Sea and seasonal variability in its T-S characteristics.

APPROACH

We will use primarily the Air-deployed Expendable Bathythermograph and Temperature-Salinity profile data archived in the Master Oceanographic Observations Data Set (MOODS) at the US Naval Oceanographic Office (NAVOCEANO) to investigate both the synoptic and climatological circulation in the upper Japan Sea.

WORK COMPLETED

This year we have focused on obtaining the historical hydrographic data, assessing its contents and organizing the data using the HydroBase tools developed by Curry (1996). We prepared summary plots and presented them at the Japan/East Sea PI meeting in San Diego.

RESULTS

We have obtained a large amount of historical data from the US Naval Oceanographic Office that was collected in the Japan Sea and East China Sea, including about 335,000 temperature profiles and 144,000 temperature-salinity profiles. All of these data are in the “public domain”. About 20% of the temperature profiles were obtained with high-resolution Expendable Bathythermographs and Air-deployed Expendable Bathythermographs. The vast majority of the temperature-salinity profile data (almost 80%) is hydrocast (bottle) data. Data originates from British, Korean, Japanese and US sources. We are just getting underway with quality control analysis.

IMPACT/APPLICATIONS

Our results will provide a better description of the seasonal dependence of the branching of the Tsushima Warm Current downstream of Tsushima Strait, a statistical description of mesoscale eddies in the Japan Sea and quantitative measurements of the seasonal changes in their structure, and a more detailed description of the branching of the Kuroshio and its role in setting the T-S properties of the flow into the Japan Sea.

RELATED PROJECTS

We plan to collaborate with other PIs working within the Departmental Research Initiative in the Japan Sea. Our work will relate particularly to that of Drs. Watts and Wimbush who will be making new observations of the mesoscale variability in the southern Japan Sea.

REFERENCES

Curry, R. G., 1996. HydroBase: A Database of Hydrographic Stations and Tools for Climatological Analysis. W.H.O.I. Technical Report 96-01, 44 pp.